Report No: TDAP-Mining

Series : 04/2022

Utilization of Soap Stone Reserves in Pakistan: Benefits and Challenges

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Trade Development Authority of Pakistan

June, 2022

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Executive Summary

Talc is the softest mineral, with a Mohs hardness of 1, compared to diamond, which has a hardness of 10. It is water insoluble but slightly soluble in dilute mineral acids. Talc has numerous applications, particularly as an industrial mineral due to its resistance to heat, acid, and electricity. Its properties allow it to be used as a counter top, an electrical switchboard, ceramics, and insecticides. It is also used as a filler in paints and rubber.

Pakistan has significant resources of high-quality talc deposits. The majority of its mines are in Khyber Pakhtoonkhwa, with the largest deposits in Sherwan (Hazara), Swat, Jamrud, Kurram Agency, SafedKoh (near Parachinar), and LandiKotal. Pakistan has 600,000 talc reserves and produced or extracted 4,684 tonnes on average between August 1999 and June 2020. The data peaked at 20,631 tons in February 2017 and the lowest was 0.0001 tons in February 2014. Pakistan ranks ninth in the world in terms of talc production, with a share of 2.25 percent. China, on the other hand, is the largest producer of talc. Following China, the United States, India, Finland, and France are the world's largest talc producers.

The United States, China, the Netherlands, and Italy are major talc exporting countries. With an average export of $60 million, Pakistan ranks seventh among global talc exporting countries. Germany, France, Belgium, Austria, Italy, the United States, Canada, and Japan are the world's top talc importers.

The talc market's future appears bright, with opportunities in paper, plastic, ceramics, paint & coating, roofing, cosmetics, and other industries. It is expected that powdered talc exports will exceed $5 billion by 2031. As a result, it is a potential investment sector. With a 5.8 percent CAGR from 2020 to 2026, the global talc market is expected to reach $3.3 billion by 2026.

Due to poor law and order in talc-producing areas such as Jamrud, Kurram Agency, and LandiKotal, Pakistan's share of global talc exports is less than 2%. On a global scale, talc has a high export potential. To increase Talc exports, which are currently far below their potential, exploration in virgin areas for additional deposits, reliance on Afghanistan should be reduced, local mining techniques should be upgraded, and licensing issues should be resolved, resulting in more export and import substitution. A joint venture with leading Talc dealing companies may be formed in order to bring cutting-edge technology in mining and subsequent processing in accordance with international market standards.

Chapter 1

Introduction

Talc is a mineral composed of hydrated magnesium silicate. It is very soft and can be cut with a knife. Talc is the softest mineral, having a Mohs (scale of hardness) hardness of 1, compared to human skin with a hardness of 1.5. Talc is insoluble in water, but it is slightly soluble in dilute mineral acids.

It is formed through alteration of ultrabasic rocks and high pressure of siliceous dolomites. In addition to the mineral talc, talc deposits may also contain magnetite, quartz, chlorite, magnetite, serpentine, anthophyllite, tremolite, dolomite, and actinolite.[1] The mineralogy of each deposit is determined by the elevated temperature and pressure under which it is formed. Practically all of the talc products offered are impure. The most common host for talc ore bodies is dolomite & ultramafic rocks. Color variations range from snow-white to black, including greenish gray & various shades of green, pink and even red.

A high purity massive talcose rock is called steatite, while the impure massive variety is referred to as soapstone. In PCT Codes of Pakistan Customs it is stated as Natural steatite and talc under HS Code 252620. Natural talc occurs in many colors for example it can be white, green, dark green, yellow and brown depending on its composition of different mineral like magnesium, silicon, oxygen and hydrogen.

Although soft, soapstone is a very dense (non-porous) stone, more so than marble, slate, limestone and even granite. Since soapstone is impenetrable, it will not stain, no liquid will permeate its surface. Other stones, including granite, have a propensity to soil, this is why soapstone (steatite) is widely used in chemistry lab countertops and acid rooms. It is also hydrophobic, which makes it water resistance.

There are many uses of talc, especially as an industrial mineral because of its resistance to heat, acid and electricity. Because of these resistances it can be used as counter tops, electrical switchboards, ceramics, and insecticides. It is most commonly known as the main ingredient in talcum powder. It is also an important filler in paints and rubber. Talc is used commercially

[1] Virta, R. L. (1989). The talc industry--An overview

because it can retain fragrance, purity, softness and whiteness. Some of the major markets for talc are ceramics, paper and plastics. Ground talc is used in roofing and cosmetics. Soapstone is used for sculpture, tile, and kitchen counter, sinks, wall tile and even for woodstoves and fireplaces.

Due to its usage in number of industries, talc demand is increasing globally. In 2021, global talc production totaled 7.6 Million tons, rising by 2% compared to 2020. Demand from ceramic, paint and rubber industries increased. Currently the largest talc exporting countries are USA and China. China is the largest producer of talc in the world followed by Brazil, Finland and France.

Pakistan holds world best quality talc but is extraction is minimal due to lack of extraction techniques. Although Pakistan exports approximately USD 60 Million in 2021, there still exist a high revenue generation potential.

1.1. Significance of the study:

Talc known reserves are estimated to be 0.6 million tons. The maximum production was 160,000 tons in 2018-2019.[2] Pakistan's exports represent 7.3% of world exports for this product, its ranking in world exports is 7th. Pakistan exported 64.7 million USD worth of talc in 2021.[3] The export value can increase with measure to counter the existing loopholes in the final product export.

[2] Pakistan Bureau of Statistics
[3] ITC Trade map

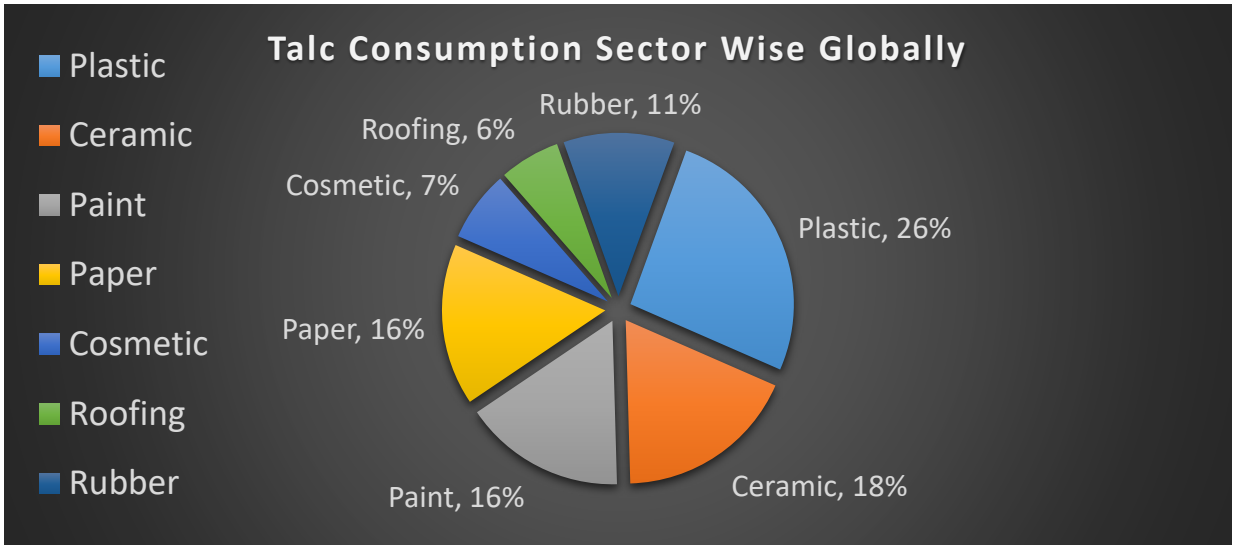
Chapter 2

Global Trade Scenario

The future of the talc market looks promising with opportunities in the paper, plastic, ceramics, paint & coating, roofing, cosmetics, and other industries. It is estimated that by 2031, the powdered talc exports will further increase by $5 billion. Thus, making it a potential sector for investment. The global talc market expected CAGR is 5.8% from 2020 to 2026.[4] The major drivers for this market are increasing use of plastics in automotive, growth in demand for paint and coatings in construction and industrial sectors, and increasing demand for cosmetics products. This is due to increased Polymer Engineering Applications and the development of Asbestos-Free products.

Asia holds a lot of promise for global talc market. It is set to emerge world's largest talc market in the future. Globally, Asia exported almost US$ 3.08 Billion worth of talc in 2020. Based on these trends, the market in Asia is expected to yield around 50% of global talc revenue.[5]

Figure 1: Talc consumption sector wise globally



Source: Mineral Commodity Summaries 2020

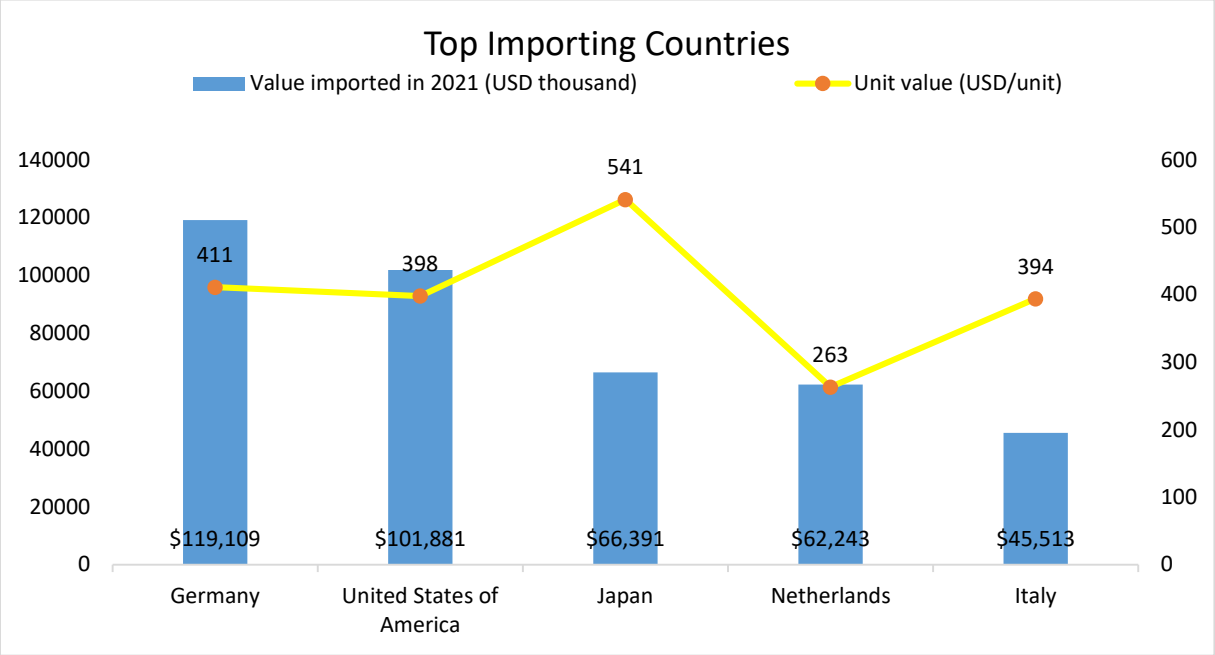
[4] Growth Opportunities in the Global Talc Market 2021-2026
[5] Growth Opportunities in the Global Talc Market 2021-2026

North America is another potential market for talc- especially in the automotive, cosmetic, rubber, and plastic sector. The growing demand for paper recycling has also fuelled the growth of the talc market. As per Fact.MR's projections, the share of North America in the global industry will increase to 30% in the coming future. [6]

In China, talc is often used to recycle paper, thus the paper industry continues to grow with this trend, which in turn also leads to the growth of the market. The domestic development of talc in China has also helped to flourish the business. Talc production in Europe is estimated at 1.3 million tonnes per year. According to Fact.MR, the market for talc in Europe is likely to account for 20% of global demand through 2031.

2.1 Global Talc Import Market trends:

Figure 2 World top Exporting Countries



Source: ITC Trade Map

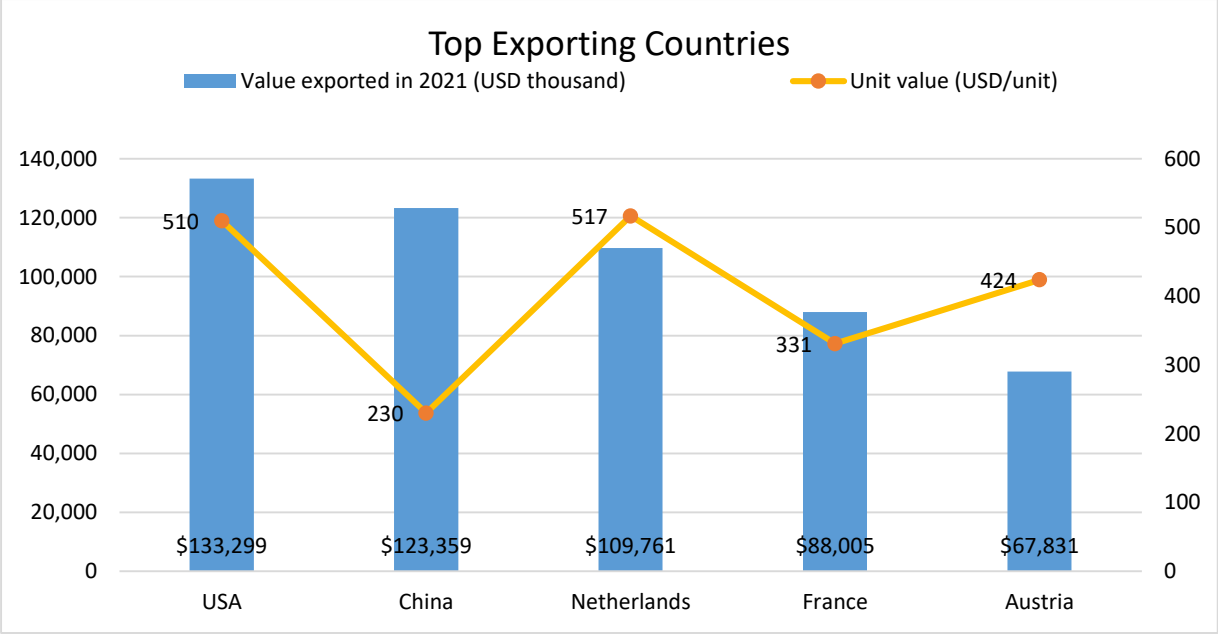
The above figure shows the top five importing countries of Talc (HS 252620, Natural steatite and talc, crushed or powdered). Germany is the top importer of talc. This is due to the increasing use of talc in automotive industry. It is used for making automotive plastic and automotive catalytic converters. The second largest importer is USA which accounts for USD 101.81 Million of imports. USA is a large manufacturer and uses talc in paint (23%), ceramics (20%), paper (15%),

[6] Talc Report by FACT.MR 2020

plastics (12%), rubber (4%), roofing (3%), and cosmetics (2%).[7] In context of unit price per ton purchase, Japan is on the top. Followed by Germany and Italy.

2.2 Global Talc Export Market trends

Figure 3 World top Exporting Countries



Source: ITC Trade Map

The above figure shows the top five exporting countries of Talc by value of exports. USA being the second largest importer of Talc secures the top spot for exports by value. Out of the total export market of USD 900 Million, USA share is USD 139 Million. It is followed by China as it is the largest producer of talc in the world. It's important to note that in terms of quantity exported China surpasses USA by double the amount. The former exporting 537,065 metric tons and the later exporting 261,571. USA exports per ton in USD 510 and China exports in USD 230 per ton, this the main reason for the value difference despite China being the largest producer. Apart from China all the other exporting countries unit price is above USD 330 metric ton.

[7] Talc Data Sheet - Mineral Commodity Summaries 2020

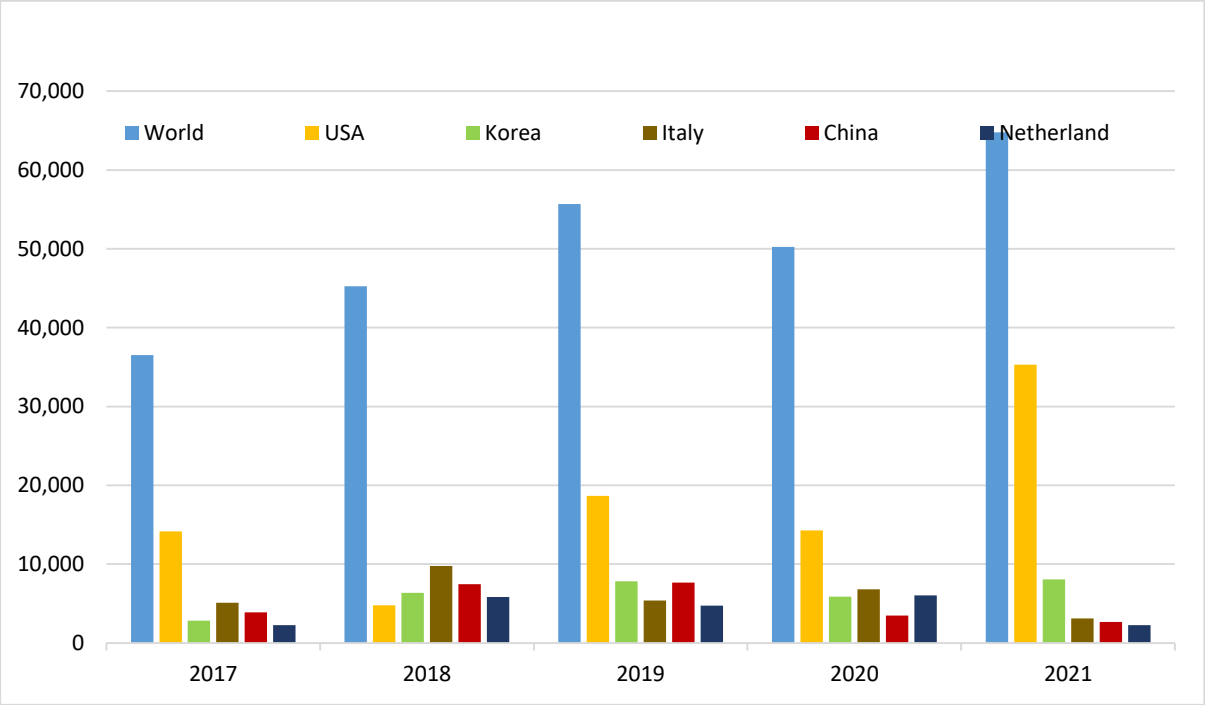
Chapter 3

Pakistan Trade Scenario

Pakistan's exports represent 7.3% of world exports for this product, its ranking in world exports is 7th. Pakistan exported 64.7 million USD worth of talc in 2021.[8]

3.1 Pakistan's Top Exports:

Figure 4 Top Exporting Countries of Pakistan:



Source: ITC Trade Map

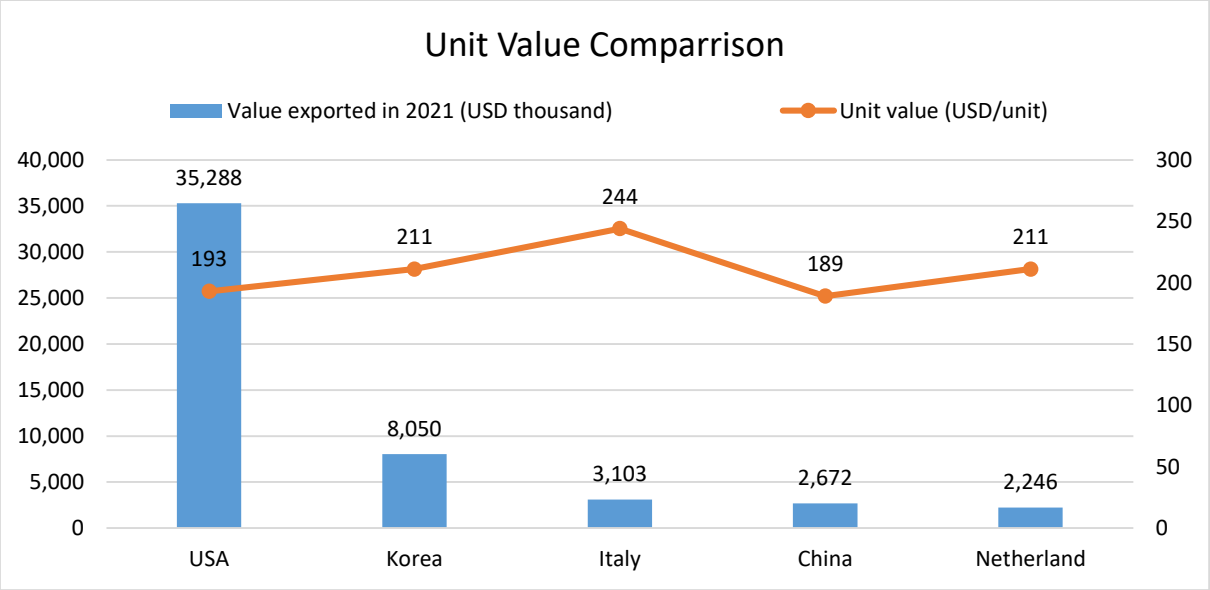
Over the year, global exports of talc have substantially increased. In 2021, the exported value was USD 64,771 Million. Pakistan is the 7th largest exporter of Talc. USA is the top exporting destination for Pakistan with export value of USD 35,288 Million. According to the USGS report USA's 41% talc is imported from Pakistan followed by Canada 27%. The second exporting country is Korea with an increasing trend in exports from Pakistan. It has surpassed Italy and Netherlands in 2018 with an export value of USD 8,050 Million. This is mainly due to the

[8] ITC Trade map

increasing plastic and paper industry in Korea. Italy and Netherlands are top exporting countries for Pakistan as there ceramic industry and automotive industry use high grade talc. Quantity wise share is low for the other countries as compare to the USA. China also imports from Pakistan but the value is low as China is self-sufficient in its production.

3.2 Pakistan's Unit Value Comparison:

Figure 5 Unit value Comparison



Source: ITC Trade Map

A glimpse at the Pakistan's export trends reveal that it is exporting Talc at a very low per unit price as compared to the average world rate. Pakistan, on average, exports Talc to USA at $193 per unit. However, average import price of USA is $398. After value addition, USA exports talc to the world at $ 510 per unit.

Pakistan exported at USD 211 per unit to Italy. Nevertheless, Italy's average import price is $394 per unit. Through value addition USA exports talc at USD 397. There is also a huge difference in the Unit price of Pakistan exports to Netherland which is USD 211 and the price at which Netherlands exports after value-addition. It exports at $517 per ton. Thus, earning $306 per unit after exporting Pakistan's talc.

Pakistan is exporting Talc at a low price. This is largely due to lack of value addition to this product. Mostly the talc which is exported is in lump form. It is just exported after crushing. If milling (meshing technique) is applied, then it can be exported at higher per unit price. Unfortunately, no exporter in Pakistan has milling machine expect one exporter Omer Associates. The countries mentioned above import talc from Pakistan at cheap prices and then after meshing, they export it at high cost.

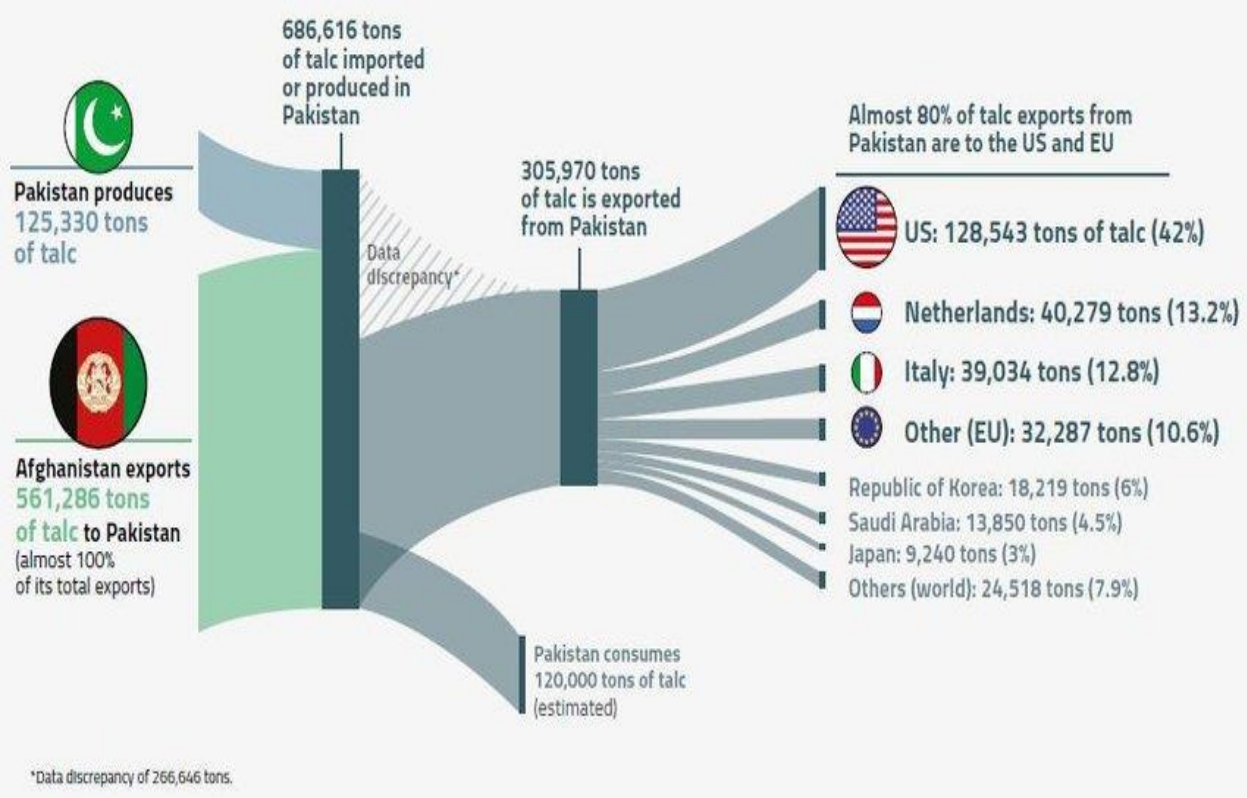
3.3 Pakistan's Import of Talc:

3.3.1 Pakistan's dependence on Afghanistan:

Pakistan imports high grade talc from Afghanistan through legal as well as illegal means. The talc that is imported from Afghanistan has 92-98% brightness. It is extracted from Shinwar and Deh beta which is almost two hours' drive from Jalalabad. The Shinwar talc belt is the one which touches Khurram agency. Most of the extraction by the locals is carried out in Shinwar.[9] The methods used are traditional without use of upgraded extraction techniques. There is documentation issue with the imports from Afghanistan due to the security situation and lack of Custom authority at this border. Locals on their own supply to the border from where the Pakistani exporters send it to Karachi port. Some crushing plants are situated in Karachi, where the lumps are crushed and exported.

[9] Sajjadpour, 2020

Figure 6 Talc Trade from Afghanistan



The Talc Trade from Afghanistan and Pakistan in 2016 (Global Witness, 2018)

Pakistan imports 90% of its exported talc from Afghanistan. The talc that is imported from Afghanistan is locally crushed and concerted into the powdered form. According to data from Global witness, in 2018, 561,286 tons of Talc was exported from Afghanistan to Pakistan. More than 45% of which is not documented. As per the documented data, Pakistan extracts 125,330 tons of talc locally in 2016.[10]

Some of the talc that is extracted locally is not accounted for due to inadequate policies of Directorate of Mines which is under the control of provinces. Undocumented import from Afghanistan and unaccounted local extraction in Pakistan is the major reason due to which there are discrepancies in production and consumption data. The locally extracted talc is of low grade mostly yellow grade in color. This is consumed by local industries as it is cheap as compared to the white grade. Paper industry, Paint industry and Plastic industries located in Lahore and

[10] Global Witness 2018

Faisalabad are the local industries which consume talc. The local industries used 120,000 tons of talc in 2016.

The facility installation cost is either expensive or even if the foreign firms who are willing to install screening mill and grinding mill are not attracted due to the custom duties that are applicable on these machineries. White grade talc from Afghanistan is expensive in the international market, the local industries lack purchasing power so it's not consumed domestically.

3.4 Pakistan's Potential Markets for Talc Exports

First potential market can be Japan. The quantum exported to Japan is very low. Japans total import market for talc products is worth USD 66.391 Million making it one of the biggest talc importers with imports of 122,270 tons in the year 2021.While Pakistan's share in this market worth millions is only USD 1.07 Million which is only 1.6% of the total market share. Japan's major imports of talc products are from China and USA at price 512/ton and 898/ton respectively. While average import price is 541/ton from the world. Pakistan exports Talc powder to Japan at USD 356/ton. Standard deviation from average price is negative USD 185/ton. Pakistan can divert its talc export to Japanese market to increase their export revenue by playing with the prices and increasing the export quantity by diverting the trade from markets which are paying less prices to Japanese markets where price for talc powder is comparatively high. Capturing only 10% of market share in Japan can increase Pakistan's export revenue by USD 2.269 Million i.e. increasing export quantity by 12,270 Tons per year.

Germany can also be an importing exporting destination for Pakistan as it's the largest importer of talc. Germany imports large quantity of talc almost 290,000 tons per year worth USD 120 Million. Pakistan exported negligible amount to Germany. Its top imports are from Netherland and Italy which export talc to Germany at USD 453/ton and USD 374/ton while average import price from world is USD 450/ton. Pakistan exports talc to countries which re-export to Germany at high price. If Pakistan can capture minimum of 5% market share it can increase its export revenue by almost USD 3 million.

Thailand can be a potential export market for Pakistan as Thailand imported 105,000 tons of talc in 2021 while Pakistan only export 3000 tons. The increasing demand is mainly due to the increase in its rubber industry.

Chapter 4

Talc Reserves in Pakistan

4.1 Locations

Pakistan has major resources of best quality Talc Deposits in the world. Its mines are located in:

- Sherwan (Hazara)
- Shangla Par (Swat)
- Mehmund agency (Khyber Pakhtunkhwa)
- Khurram Agency
- Safed Koh (near Parachinar)
- Zhob (Baluchistan)
- Nauseri (Azad Jammu & Kashmir)

  Talc (Soap Stone) deposits located in Khurram Agency are of good quality matching to International Standards i.e. brightness ranging from 92% to 98%.[11] However, detailed exploration is needed to prove the exact quantity and quality of reserves.

4.2 Reserves

0.6 Million Metric tons[12]

4.3 Mining

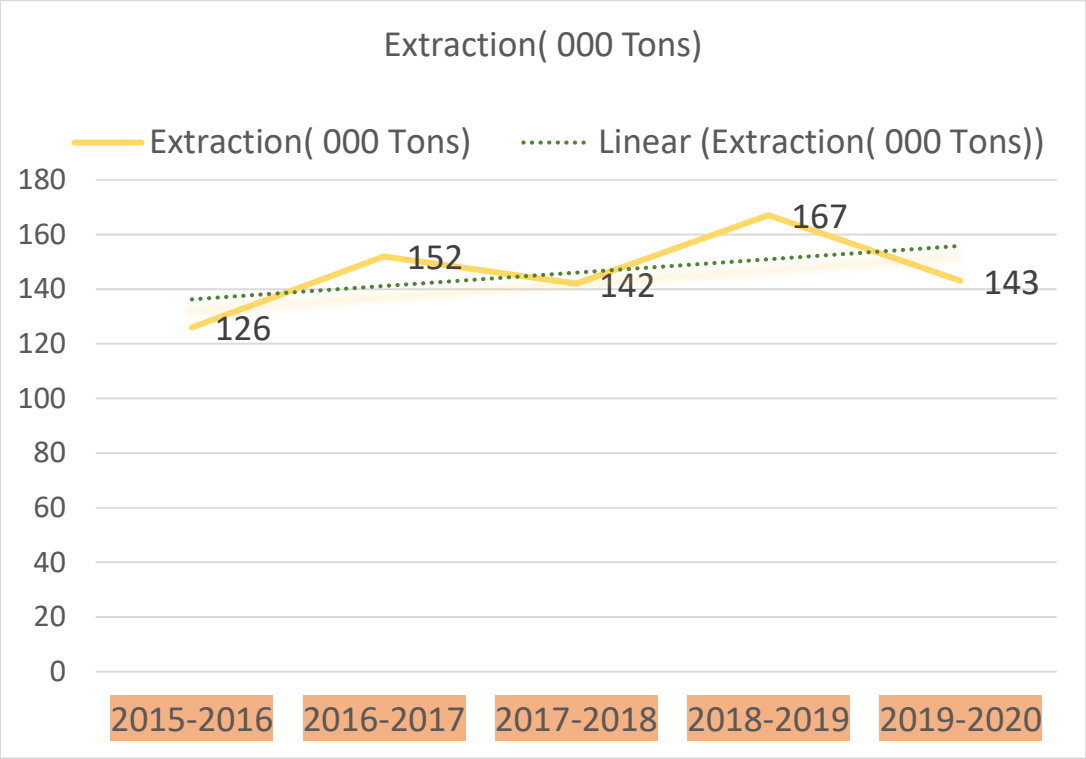
Talc is a rock that is mined from open-pit and underground deposits. In Pakistan talc is mined from open pit as the deposits occur on the surface, open pit mining is less costly as compare to underground mining. Because it is a natural product, talc is always found in combination with at least one other mineral whose proportion depends on its geological origin. Chemically pure talc has never been found in nature in commercial quantities.

[11] Martin,2018
[12] Pakistan Bureau of Statistics

4.4 Extraction or Production and Reserves

Below figure shows Talc extraction from 2015 to 2020 in Pakistan.

Figure 7 Extraction from 2015-2020



Source: Pakistan Bureau of Statistics

Chapter 5

Talc Processing Plant

In the talc production process, the production of talc is mainly four steps:

5.1- Extraction: Done through open pit and underground mining.

5.2-Benefaction: In the mining industry or extractive metallurgy, beneficiation is any process that improves the economic value of the ore by removing the gangue minerals. The process used is either flotation (through HCL) or crater processing (through Magnesium Carbonate). After the beneficiation, the quartz and carbonate minerals are separated from the talc by crater processing

5.3- Crushing: Crushing plant is to crush a variety of ores to different particle sizes according to the production demands. Mostly crushing is done by jaw crusher costing from USD 200,000 to USD 300,000.

5.4-Milling or Grinding: Milling equipment is to prepare various materials into all kinds of powder products as needed. For Milling Raymond mill is used costing USD 500,000-600,000. Also Vertical roller plant is used costing USD 700,000-800,000 or Ultra-fine roller costing USD 600,000-650,000 is used. The Mesh level is defined from the specifications of the machines, higher the specification, higher the Mesh produced and higher the cost.

Process	Technique	Estimated cost
Extraction	Open pit mining Underground pit mining	Depends on location
Benefaction	Flotation (through HCL) crater processing (through Magnesium)	
Crushing	Jaw Crushing	$20,000 and $30,000
Milling or Grinding	Raymond Mill Ultra-fine Roller	$70,000 and 80,000 $20,000 and $30,000

Based on the natural crushability and grind ability of talc, the talc processing equipment used is mainly Raymond machine, mechanical impact mill and airflow mill. The main processing equipment for the production of 200 mesh, 325 mesh 500-1250 mesh talc. Mesh is the particle standard size unit used for talc.

In Pakistan the plants available can only produce talc powder of 300-350(0.0017inch) mesh not more than that. The mill plant required to mesh more than 800(0.0004inch) Mesh costs USD 700,000. The dry process of talcum powder is from the selection of talc to coarse crushing. After drying and crushing, fine grinding and ultra-fine grinding are carried out. The talcum powder can reach a fineness of 500-5000 mesh.

Ultra-fine talcum powder is currently used in the world's ultra-fine powder products. The market demand for talcum powder is increasing, which has also promoted the continuous innovation of talc processing equipment. The higher the application level of talcum powder, the higher the equipment requirements for the talcum powder grinding machine, the more need for ultra-fine mill, high-pressure suspension roller mill, in order to make the output value of talcum powder reflect.

Chapter 6

Industrial uses of talc and its applications:

6.1 Paper Industry

Talc is used in a variety of paper products, including wrapping paper, writing paper, packaging paper, and paperboard products. It is used principally for pitch control the pitch adheres to the surface of the talc and is dispersed throughout the paper rather than agglomerating to form spots in the paper products. Talc also fills the interstices between the cellulose fibers, reduces the transparency of the paper, increases the brightness of the paper, improves ink reception, increases paper density, and reduces the demand for more expensive paper pulp.

Printing and writing papers can contain up to 30% filler, paperboard products 10 %; and newsprint, 8%. Talc is selected as a filler because of its high whiteness, its nonabrasive nature, its chemical inertness, and its availability in ultrafine particle size. Competing minerals as paper fillers include calcium carbonate, kaolin, and titanium dioxide.[13] Below written is the specification of talc for paper industry.

Gravity	Color	Mesh	Grade	Unit price
2.0-2.5	White and Yellow	400	Medium	USD400/Ton

6.2 Plastic

The plastics category includes polypropylene, nylon, polyvinyl chloride, polyethylene, polystyrene, and polyester. Talc is used primarily as a filler. It can compose up to 50 % by weight of the components in plastics. As a bulk filler, it reduces the amount of resin required in the product and thus reduces costs. Talc also imparts desired physical, electrical, and processing properties to the plastic.

Talc can also be used as a dusting agent to reduce friction between plastic coated electrical wires in electric cables and cords. Chemical and heat resistance, impact strength, dimensional stability, thermal conductivity, tensile strength, creep resistance, and electrical conductivity can be

[13] (Marzbani, 2013)

improved using talc as a plastics filler. Talc competes with carbonates, clays, feldspar, mica, silica, and wollastonite as a mineral filler.

Plastics with talc fillers exhibit higher stiffness and creep resistance at ambient and elevated temperatures than do plastics with mineral fillers such as calcium carbonate. For example, a polypropylene with a 40% loading of talc filler has a stiffness 3 times that of polypropylene with no filler and 1.5 times that of polypropylene with a 40 % loading of calcium carbonate. Below written is the specification of talc for plastic industry.

Gravity	Color	Mesh	Grade	Unit price
1.5-1.8	Any color	300	Medium	USD400/Ton

6.3 Paint and coatings

The paint category covers all varieties of paints: water based, oil-based, synthetic resin paints, and lacquers. Talc is an excellent rein forcer and greatly reduces cracking in the dry paint film. Talc also reduces settling and separation of the paint components, helps to smooth ridges left during brush applications, is an inexpensive extender for more expensive white pigments, control glosses, improves durability, fights rust (anti-corrosive), prevents cracking, and enhances smoothness. and absorbs oil better than most minerals.

Talc is selected for use in paints based on chemical composition, oil absorption, particle size, particle shape, particle size distribution, refractive index, and water- soluble matter content. Talc competes with calcium carbonate, kaolin, barite, and mica as a filler and extender in paint.[14] Below written is the specification of talc for paint industry.

Gravity	Color	Mesh	Grade	Unit price
2.5-2.8	Any	325	Medium	USD450/Ton

[14] (Marzbani, 2013)

6.4 Rubber

Talc is used by the rubber industry in the production of tires, tubing, sheets, valves, flooring products, backing for textiles, and electric cable insulation. Talc is used as a dusting agent to prevent sticking of the rubber to the mold, to reduce the amount of expensive resins used to produce rubber products, to increase the stiffness of uncured compounds, and to reinforce rubber products.

The talc should be less than 45 um in size and contain no abrasive minerals that could cause wear of the processing equipment. Talc should be white when used as a filler in latex fabric backings, but color is not critical for most other uses in rubbers. Talc competes with calcium carbonate, kaolin, and silica.

It helps give rubber its bounce. Rubber hoses made with talc are used in just about every automobile on the market. With its high heat resistance and bonding power talc helps make the hoses less permeable. Rubber manufacturing industries can use any grade of talc thus Pakistan can export talc to rubber manufacturing economics if extracted efficiently. Below written is the specification of talc for rubber industry.

Gravity	Color	Mesh	Grade	Unit price
1.8-2.0	Any	400	Medium	USD470/Ton

6.5 Personal Care Industry/ Cosmetics:

Due to Inert, soft and fragrance-retentive nature of Talc it is used in manufacturing of Cosmetic Products. Cosmetic uses for talc encompass all varieties of face powders and body dusting powders. Over 50% of most cosmetics is talc, the remainder being a combination of oxides, stearates, perfumes, and starch. Talc is used in cosmetics to impart softness and lubricity.

Cosmetic talc must meet strict standards to assure the quality of the product. The major requirements are that 98% of the particles should be less than 800 mesh and that the talc should contain no gritty material, contain less than 6% acid soluble minerals and no amphiboles/asbestos, and have a consistent color and mineralogical composition according to the requirement. The softness and oil absorption it offers make it a primary ingredient in blushes, eye shadows and powder compacts. It helps absorb wetness and odor produced by the human body. The talc used

in cosmetics is white talc which is present in Khurram agency and Afghanistan. Below written is the specification of talc for cosmetic industry.

Gravity	Color	Mesh	Grade	Unit price
2.5-3.0	White	800	High	USD650/Ton

6.6 Ceramics:

Talc can be used in several applications within the ceramic sector, for example talc is used as filler within technical ceramics, in automotive cordierite ceramics, several tiles and within fireproof ceramics. Further the micro crystalline structure talc offers the possibility to use the talc for electrical ceramic applications. In general, the addition of talc has positive effects to ceramic, for example it increases the mechanical and optical properties of the ceramic material and glazes. Through addition of talc, the properties of the product can be changed and the combustion temperature is reduced. This has a positive effect on the production costs.[15]

6.7 Pharmaceuticals:

Many anti- fungal powders include talc to help kill bacteria off and improve the odor of the body. Talc is used in many commercial antacids for stomach and indigestion problems. Pharmaceutical Grade Talc is used as an inert filler in tablets and as a lubricant / glidant in tablet coatings. Pharmaceutical grade talc's are also widely used in medicated foot powders, creams, lotions, ointments and as a release agent in tablet molds.

6.8 Electricity industry

Electrical Insulators are often made with talc. This lowers the wasted energy produced from electrical devices. Cables, to improve electrical insulation.

6.9 Textile industry

Finely ground Talc is used for bleaching of cotton sacks.

[15] (Ahmed, 2007)

Chapter 7

Issues

1. The major issue which Pakistan face is its dependence on Afghanistan. Pakistan imports talc form Afghanistan through proper channel and through smuggling. If the Afghan market gets affected by security threats from Taliban, the production gets affected. Thus, damaging Pakistan's exports. Also Taliban demand share from the local mine owners increasing the cost of the product. Supply chain of this imported talc often gets disrupted due to border and custom issues.
2. The local talc is of low quality mainly yellowish in color. The international market demands white grade talc. The process of purifying talc is expensive due to which there is no purifying plant in Pakistan. The white grade reserves are in abundance in Khurram agency but it's still not extracted to its full potential, only local extract it through traditional techniques. This is due to lack of extraction techniques required for extraction and due to the local area dynamics which are very hard to understand for outsiders. If the locals are not involved in the process, then it gets difficult for the outside investor to take part in the mining process. Additionally, it's risky and time intensive. Most of the investors don't take risk as banks are reluctant to finance minerals related projects.
3. The talc from Afghanistan and Khurram agency which is white in color needs to be Mesh at different levels for different industries. For example, mesh at 300, 400 and 800 is used in paper, paint and rubber industry respectively. The process of Meshing available in Pakistan is only to 350 mesh. USA import white talc from Pakistan and use it in its domestic industry as well as for exporting at increased per unit cost through meshing.
4. In Sherwan area, soapstone is being extensively mined from dolomite beds for last two decades. The companies working on these mines are mostly local and thus lack proper mechanisms and planning to keep these mines safe and stable. The owner's goal is only to reach the maximum production ignoring the lives of miners along with excavation method

and safety and stability of an area. Most of the mines are under the danger of subsidence and some are already collapsed in the area.[16]

5. Licensing is very technical in the industry. Most of legitimate land owners do not have expertise to obtain license and to get a NOC for explosives and extraction due to which mining process is stagnant. Moreover, most of the land is owned by real estate mafia and their stakes are not involved in mining.

[16] (Habib, 2018)

Chapter 8

Policy Recommendations

As for Pakistan, talc is an important mineral as it accounts for more than 60 million of export. This is due to the increase in the global demand and the equipment from due to the increase in the global plastic industry and the rubber industry as its requirement are increasing day by day. The major players are USA and China due to their major manufacturing in the plastic, paint and rubber industry.

Manufacturing plants should be installed such as ball mills, Raymond mills, airflow mill and ultra-fine mill to mesh talc to high grade white talc and removing quartz and carbonates. Setting up plant is feasible in the economic zones such as FATA due to tax exemption. Moreover, these industries will help in value addition process by converting the blocs into powder form which is going to increase Pakistan's export revenue. Tariff structure should be discussed for these industrial units to start the industrial activity.

New markets should be discovered as suggested in the report. Trade should be diverted to markets where Pakistan can increase its export revenue at the same exported quantity. Which is a short-term measure to handle Pakistan's trade deficit at the moment.

Concerned government departments like Directorate of Mines and Minerals should allocate trained resources for the talc sector as every mineral has specific and distinguished dynamics. Only trained and specialized individual can understand the sector and carry out policies for its flourishment.

3D mapping of talc and identification of its reserves is very important as it is one of the main issues currently faced by Pakistan. Resources can be extracted and utilized only when the reserves are identified efficiently and effectively. Local miners should be educated about the extraction techniques and ways to cater the issue of climate change during extraction process. Also the reserves of Khurram agency and Parachnar needs to be extracted as its white in color and the areas lack basic facilitations like roads.

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